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APPLICATION NOTE 4132

# ATTACHMENT METHODS FOR THE ELECTRO-MECHANICAL 1-WIRE CONTACT PACKAGE

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*Abstract: This application note discusses Maxim Integrated's patented 1-Wire<sup>®</sup> Contact Package solution for electro-mechanical contact applications. It discusses traditional packaging solutions and demonstrates the superiority of the 1-Wire Contact Package solution. The article recommends ways to attach 1-Wire Contact Package to an accessory or consumable. Mechanical specification and reliability analysis are provided.*

## Introduction

Adding electronic functionality to traditionally nonelectronic peripherals and consumables is becoming a common system requirement. Typical system-driven requirements include storage of calibration data or manufacturing information, or OEM authentication of the peripheral, accessory, or consumable. Besides selecting the proper memory and security functionality for these electronic requirements, one must add an electrical connection between the host system and peripheral.

The patented 1-Wire Contact Package (formerly known as the SFN package) is specially designed for electro-mechanical contact environments. Typical applications of this package include object identification/authentication and automatic calibration using data stored in the memory chip. Authentication ensures reliability and quality, which otherwise could be undermined by low-quality cloned products. The package is ideally suited for applications such as printer consumables, medical sensors, and reagent bottles.

The 1-Wire Contact Package is designed for contact applications only and cannot be soldered.

## The 1-Wire Contact Package

The 1-Wire Contact Package is a superior solution to the problem of incorporating electro-mechanical contacts into an application. The integration of the IC and contact pads into a single package reduces the footprint and increases mechanical reliability. **Figure 1** demonstrates the basic design of the 1-Wire Contact Package.

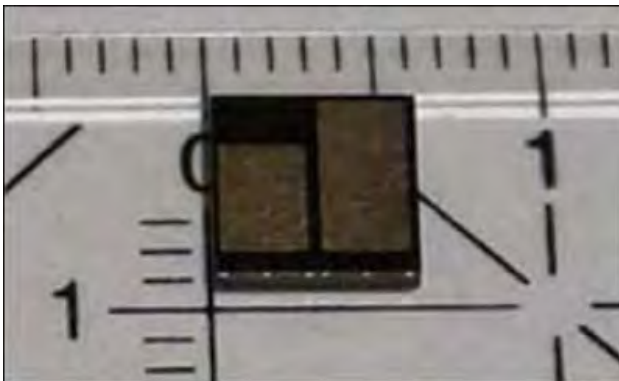


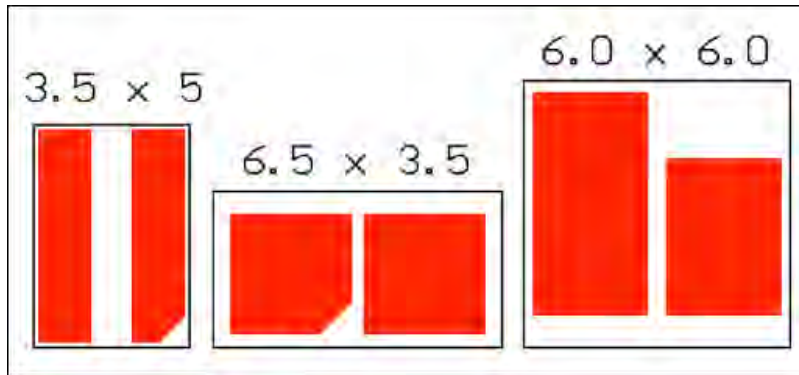
Figure 1. The 6mm x 6mm x 0.9 mm 1-Wire Contact Package. Scale is in Centimeters.

## Package Characteristics

The 1-Wire Contact Package is available in the three sizes (**Table 1**). **Figure 2** shows the relative dimensions of the three packages.

**Table 1. Dimensions of Package and Contact Pads**

Package Dimension (mm)	IO Pad (mm)	GND Pad (mm)	Package Code	Outline Drawing
3.5 x 5 x 0.35	1.2 x 4.8	1.2 x 4.8	S23A5N+1	<a href="#">21-0661</a>
6.5 x 3.5 x 0.7	2.7 x 2.7	2.7 x 2.7	T23A6N+1	<a href="#">21-0575</a>
6 x 6 x 0.9	3.55 x 2.6	5.05 x 2.6	G266N+1	<a href="#">21-0390</a>

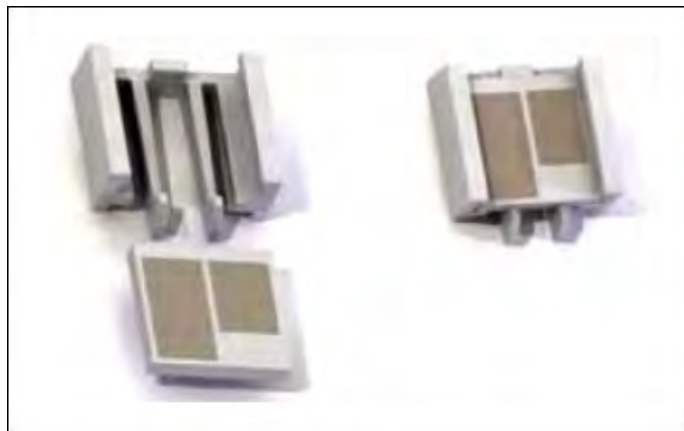


*Figure 2. 1-Wire Contact Package dimensions, bottom view.*

The lead frame is made of CDA194 copper alloy. The pads are plated with 1.02 $\mu$ m nickel, 0.02 $\mu$ m palladium, and a 0.005 $\mu$ m gold finish. The mold compound is Sumitomo® G600 or G770 or a similar product. For additional mechanical data, refer to the package outline drawing listed in Table 1.

#### Attachment Methods

The preferred method of attachment is a mechanical clip. Because every application is unique, end-customers must design mechanical clips compatible with their end product. **Figure 3** shows the theoretical design of one custom retaining clip. **Figure 4** shows a commercial application of a mechanical clip integrated into object to be authenticated. The package can also be injection-molded into a plastic object as described in application note 4717, "[Injection Molding An IC Into a Connector or Consumable Item.](#)"



*Figure 3. Retaining clip shown before and after insertion.*



Figure 4. Example of the 1-Wire Contact Package mounting clip in an end product.

Feasible alternatives to clips are double-coated foam tapes and double-coated tapes. The 3M<sup>®</sup> Company manufactures pressure-sensitive adhesives designed to operate in a wide variety of environments.

#### Choosing a connector

The 1-Wire Contact Package was purposefully designed to be compatible with low-cost, industry-standard connectors. Two commercial connectors are shown here, as well as the approximate dimensions for a custom connector.

#### Example 1: Bourns 70AB/Male – Modular Contact

Figure 5 shows the approximate points of contact for this 1.27mm pitch connector. This contact is suitable for the 6.5mm x 3.5mm and 6.0mm x 6.0mm packages and performs a wiping of the contact as it is inserted.

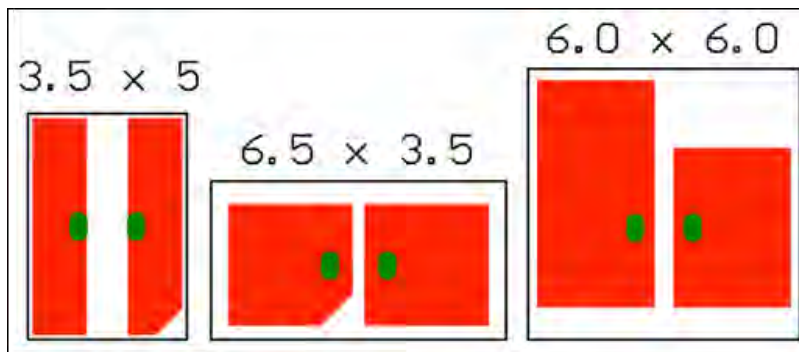


Figure 5. Bourns 70AB/male-modular contact points.

#### Example 2: Mill-Max Series 811/813 Spring-Loaded Contact

Figure 6 shows the approximate points of contact for this 2.54mm pitch piston connector. The contact points of this connector make it suitable for all three packages.

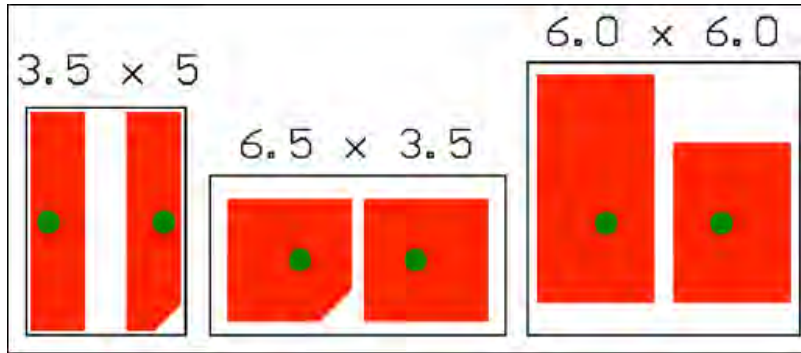


Figure 6. Mill-max series 811/813 contact points.

### Example 3: Guidance for Custom Contact Design

Figure 7 provides guidance for the construction of a through-mounted, custom spring contact. This design has the advantage of the package sliding against the spring and wiping as it is inserted.

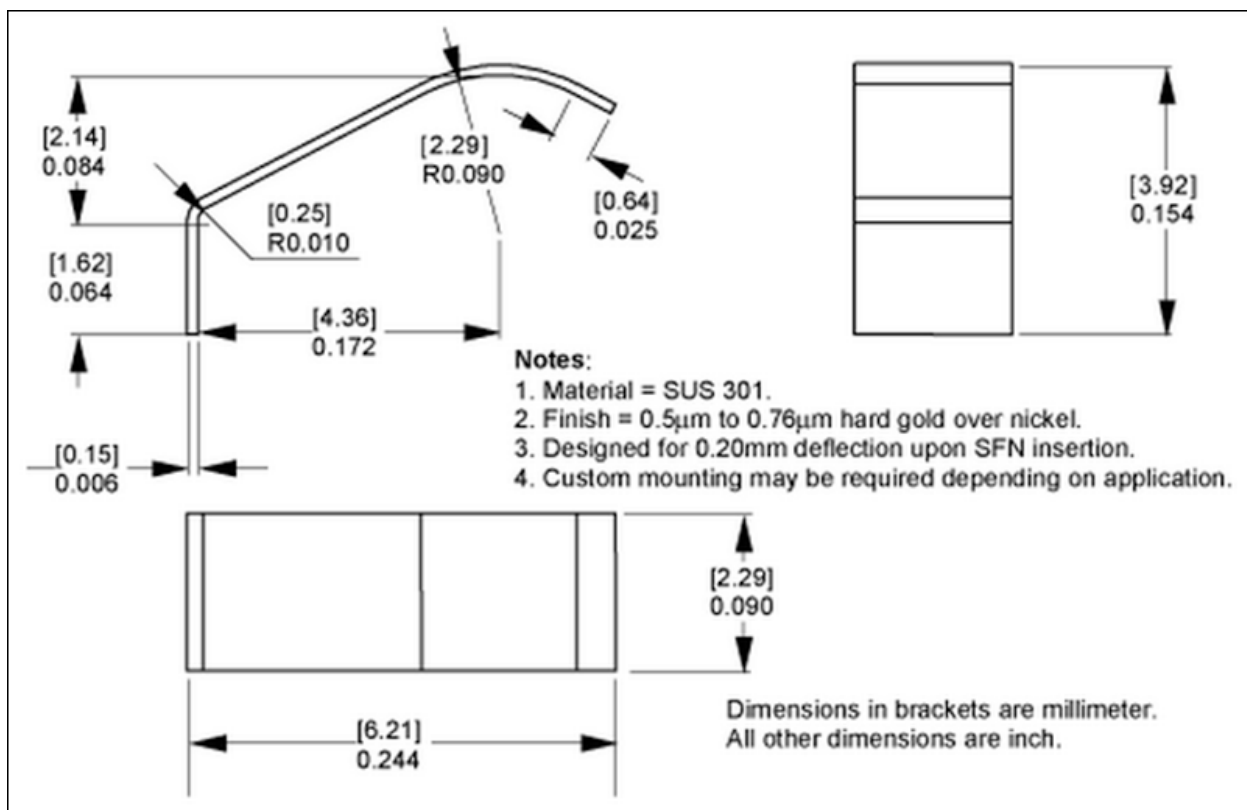


Figure 7. Custom contact example.

### Reliability Testing

Qualification tests are performed on the packages to ensure the package meets the same reliability requirements as conventional IC packages for the industrial temperature range from -40°C to +85°C.

Table 2. 1-Wire Contact Package Qualification Tests

Test	Operating life (+125°C, 5.5V, 1000 hours)
A	Mechanical verification (X-ray, dimensions, marking, lead integrity)
	Storage life (+150°C, unbiased, 1000 hours)
	Temperature cycle (-55°C to +125°C, 1000 cycles)
	Temperature humidity bias (+85°C, 85% R.H., 5.5V, 1000 hours)

Unbiased moisture resistance (85°C, 85% R.H., 1000 hours)

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Test	Mechanical life (shock test 200g, 30 cycles) followed by temperature cycle (-55°C to +125°C, 1000 cycles)
B	Mechanical life (vibration 10g, 5Hz to 2kHz in X Y Z axes, 30 hours), followed by temperature humidity bias (+85°C, 85% R.H., 5.5V, 1000 hours).

A [qualification test report](#) for the 1-Wire Contact Package is available on our website.

## Summary

The 1-Wire Contact Package is a cost-effective alternative to mounting a PCB module with a chip onto the peripheral object to be identified. Attachment options include clip-style retainers integrated into the nonelectric object and double-sided adhesive tape. Inexpensive connectors like those for mobile battery applications can provide the electrical connection. The package's reliability matches that of conventional IC packages.

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Related Parts		
<a href="#">DS2431</a>	1024-Bit 1-Wire EEPROM	<a href="#">Free Samples</a>
<a href="#">DS2432</a>	1Kb Protected 1-Wire EEPROM with SHA-1 Engine	<a href="#">Free Samples</a>
<a href="#">DS28E01-100</a>	1Kb Protected 1-Wire EEPROM with SHA-1 Engine	<a href="#">Free Samples</a>
<a href="#">DS28E05</a>	1-Wire EEPROM	<a href="#">Free Samples</a>
<a href="#">DS28E05</a>	1-Wire EEPROM	<a href="#">Free Samples</a>
<a href="#">DS28E15</a>	DeepCover Secure Authenticator with 1-Wire SHA-256 and 512-Bit User EEPROM	<a href="#">Free Samples</a>
<a href="#">DS28E25</a>	DeepCover Secure Authenticator with 1-Wire SHA-256 and 4Kb User EEPROM	<a href="#">Free Samples</a>
<a href="#">DS28E35</a>	DeepCover Secure Authenticator with 1-Wire ECDSA and 1Kb User EEPROM	<a href="#">Free Samples</a>

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